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5 Star Review



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How to submit articles

The quality of the material we can publish in
Dragon User each month will, to a very great
extent depend on the quality of the
discoveries that you can make with your
Dragon. The Dragon computer can be used
on its own with a powerful version of
Basic, but with very little documentation.

Articles which are submitted to Dragon
(even for publication) should not be more than
3000 words long. All submissions should be
typed. Please leave wide margins and a
double space between each line. Programs
should, whenever possible, be computer-
printed on plain white paper and be accom-
panied by a tape of the program.

We cannot guarantee to return every
submitted article or program, so please keep
a copy. If you want to have your program
returned you must include a stamped,
addressed envelope.

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What to be rich and famous? Or, so we can't help with that one — but if you've got something to say and want to reach tens of thousands of Dragon Users throughout the country, then this is the place to do it.		Eyes down for the next lesson — this month, we deal with number bases — the theory behind decimal, hex and binary systems.	
People's Chart	5	Graphics	18
The only nationwide poll of what you think the best in Dragon Software — compiled each month by you, the consumer. Vote, vote, vote!		Have you ever wanted to put text on to the graphics screen — even program from the graphics screen? Peter Winkler shows you how.	
News	6	Programming	24
Charity tape on the cards for the Dragon — Advance rates of new incentive releases — Dragon week-end that was — RISC Con- vention — and more ... Page Six for full details.		Ever puzzled by those sudden crashes? Alan Dray explains why this sometimes happens, and offers a remedy.	
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Your spot for those times when you need a little help from your friends. Write into us, we'll publish your problems, and maybe someone can help ... or maybe you can help someone else!		Questions, questions ... Brian Gedge once again stretches his might and comes up with some answers for those annoying technical problems.	
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At last — Moon Credits ... Roy Coates tells about this new release — Par- com's latest — Printer Control — available ... on disc at last.		A Super Summer Book Offer that will have you using for the cheque book! This one you cannot miss ... read inside for details.	
On-line	10	Arcade Arena	28
Roy Coates takes an in-depth look at two communications software packages, Chi- plus 2 and Videodata — isn't it time you got on-line?		The mysterious Expert mumbles on in- coherently for your delectation — more useful Pocus this month, plus competition for those with a good memory.	
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		Mike Gerrard reporting again — this time focusing on Space Trek II ... plus the usual bunch of clues and tips for troubled adventurers.	

Editorial

This month marks the beginning of a new phase for Dragon User — indeed Dragon users all over the country. As from next issue (July 1986) Dragon User will be available to the Dragon community BY SUBSCRIPTION ONLY. And while this means that you won't have to trundle down to the newsagent to get your favourite read (we'll send it to you), it does mean forking out just over a tenner in one month, in order to get the next 12 issues, if you don't already have a sub. So why do it?

It's our firm belief that Dragon User is still essential reading for all Dragon owners, beginners and experienced alike. We'll still have all the same regular features, news and reviews, with new ones planned even as I write! In fact, as a controlled circulation publication, we're hoping to pack even more in than usual — a new upgrading series, new languages for your Dragon, teach-in's, reader offers, competitions — we are determined to provide you with the service and information you want for your computer.

Take the Book Offer in this month's issue ... where else could you get so much for so little?

As the number of active Dragon owners has diminished (and there's no denying that the total is down to the few tens of thousands) it seems to us that the enthusiasm of the existing Users has actually increased — and it's people like you we are committed to supporting in the future.

It would be a shame if many Dragons (still a worthwhile piece of hardware — until the C300 Amiga arrives) were put away, all for the lack of information and a regular national magazine. No Dragon User — no Dragon? We hope you'll join us.

Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, Dragon User, 13-15 Little Newport Street, London WC2H 7PP.

Mail Order

I RECENTLY had trouble to return my Attean cartridge to Greenriver Software, so I just couldn't get it to work. It arrived back 48 hours later with a letter explaining how to ensure good connector contact, and the cartridge connectors had been timed for good measure.

I call that excellent service, and shows how buying goods for our Dragonfly post may not necessarily be as risky a business as your April editorial implies.

Marin Parker
14 Redwood Close
Ratcliffe
Bath

Poke Error

IN the April 1988 issue of Dragon User, Brian Cadge answered Neil Peel with a short routine to send all that appeared on the screen to a printer. This routine did not work due to the small typing error in the listing of the last POKE being POKE 581284 whereas it should have read POKE 581248. I am sure that many Users have written in to point out this error but in case they haven't, I am. As proof, this letter has been written using the very routine.

Andrew Jenkins
44 Tudor Terrace
Glaston, Abertawe
Mid-Glamorgan
South Wales
CF44 8BB

Co-Co Flee

HAVING spent many hours typing "Flee" from the March edition of Dragon User into my 32K Tandy Colour Computer, I was disappointed to find that there were several areas involved where the Dragon differs from the Tandy.

However, by disassembling the machine code and consulting my (much appreciated)

Formware series, I was able to spot the problems in the code, and I hope solve them.

Here are the changes which are necessary for the game to work:

```
00 04 200 000000 000 00 10 00
00 04 000000 -001 0000 00 00
00 04 000000 -001 0000 000 -1
0 000
000 000 000 0000 100
0000 000
000 000 0000 000 000 00 10 00
000 000 0000 000 000 00 00 00
000 000 0000 000 000 00 00 00
000 000 0000 000 000 0000 00
000 000 0000 000 000 0000 00
000 000 0000 0000 00 0000
```

I hope you will consider printing this letter, so it will enable all Tandy 32K owners to play this excellent game.

P A Chirico
158 Emphingham Road
Sarnford
Lincoln
PC9 2SS

Flee Flaw?

THE PROGRAM Flee Flaw in March's issue — I typed the whole program in, about 15 hours long. The problem is, when I ran the program nothing happened. But I did check the program, and it was correct.

Garry Bowler
32 Bridge Street
Milton
Lancs

If you typed it in on a Tandy Co-Co, Garry, you'll need the alterations we printed this month. Otherwise, all we can say is — it works!

Upgrade

I AM sure you will be pleased to know I have just managed to purchase an upgrade kit for my 48K Spectrum — it's called a Dragon 1611 I am sure that this news will lighten a few hearts, as it has done my pocket. The real problem is, that reading through your magazine, I realise how much I have missed, for example, what the hell is an OS-9?

In fact, the only fault I could really find in your mag, or should I say, the only fault I knew the meaning of, was that nasty swear word, Jer Sir Milly.

Now come on — there must be something, some book, some program, some potential

per-pal that would be able to teach me more. Given Olive (our cat) knew more about the Dragon than I did — and even that was restricted to the CLOADEL command (DEM CAT).

So please help — before I start suffering Sinclair (or is it Amstrad) withdrawal symptoms.

Robert Hammond
34 Beestree Close
Clarey
Basingstoke
Hants

2 + 2 = 4

I DO hope that my embarrassment of the esteemed Brian Cadge-only awarding two "Drapers" to my excellent Dope-Kill product (Reviews, Dragon User, May issue) is, as suggested by one of my very satisfied customers, a case of missing Dragons.

He points out that every review normally has the Dragons right or left justified — whereas these two are centred, suggesting that two have been dropped off the right-hand corner.

Should the two Dragons be his considered opinion, then I am obviously wasting my time on the Dragon.

Pam D'Arcy
21 Wycombe Lane
Woodson Green
High Wycombe
Ducks, HP12 0ND

On the embarrassment — yes Pam, I'm afraid two Dragons flew the coop in the May review... Indeed Disk-Kit was originally awarded four Dragons — and well deservedly too.

Hunter

I WISH to bring to the attention of any software hunter for the Dragon, a Bookbazar sale, where some excellent games were advertised in the April edition. There were a total of four whole pages of software programs on offer — which ended on March 31st.

This I must query. How can you put an advert in a magazine that ended the month before?

I find the only way to obtain software now, is to order through magazines — I have

found Dragon User very useful to obtain software, but now I have my doubts.

I have found it impossible to buy Dragon User before the month it should appear. Could we please have offers ending, not before you buy the magazine, but after?

Dawn Gamble
Lidburn
Co. Antrim
BT27 4LB

Bloody hot weather, the Dragon User staff hold their heads high after such a bout of leproy. The offending Advertisement Manager has been shot.

Co-Co Club

I WOULD like to start up a Co-Co Dragon users club in the Easton area, to swap programs, ideas, etc. Anyone interested, please contact me at the address shown below.

J H Kippin
187 Spencers
Leamton
Essex
SS15 5AG

Fringe

RE User Groups and the Dragon — there are many different aspects of the Dragon and the 68000 microprocessor that it is impossible that any one group or publication can satisfy all the possibilities.

The National Dragon User's Group does not have a monopoly and is in no way "official". So any other group, from "lunatic fringe" to dedicated professional is welcome. All that is required is enthusiasm and a common interest. Bulletin boards are also a form of user group — and I thank all those who have set them up.

On a more serious note the Data Protection Act comes into force from the 1st May 1988 and may have an impact on user groups, clubs, bulletin boards and anyone storing names/addresses etc. on a computer. If any reader needs more information they should contact The Data Protection Registrar on 01835 (0205) 525777.

Stan Opychael
Composure

Dragon User People's Chart

BREATH holding time ... anything can happen in the Dragon User People's Month ... and look what's happened this month. The struggle for Number One spot continues with Shocktrooper back at the top and Justification dropping one place down to the Number Two slot. People obviously spent April indoors rediscovering Jai Sel 1980s, as it forces into third place, while

Legendary anagrams include, "Have I won yet?" from Robin Hearnings ... (and ... no Robin), some blatant mauling from Neil Cow (John Cook, *Expert Editor*) and a gleeful confessional from Alister Grant (Anagrams don't like me). However, the prize goes to Ian Roddick, referring to the extra concerns in *Dragon BW* — "Dragon Heads get the pages. Smaller Boys don't." Nice work, Ian.

(Don't forget — each month we are asking you to vote for your favourite live programme, prize moment, they can be games, applications, utilities ... anything! Write them down in order of preference on the form opposite (you can copy it out if you don't want to mutilate your issue) and send it

Just for a bit of fun — and as an incentive to the more mercenary amongst us — you can also make up a phrase constructed from the letters of your own top three (using as many as you can) and we will pick out the one we consider to be best. That lucky winner will be receiving £25 worth of *advertising*. (Saves 24 characters)

Results April 1986

- | | | |
|---|-----------------------|---------------------|
| 1 | Shocktrooper | (Microdeal) |
| 2 | Juxtaposition | (Wintersoft) |
| 3 | Jet Set Willy | (Software Projects) |
| 4 | Speed Racer | (Microdeal) |
| 5 | Eddie Steady Go | (Incentive) |

Chart Five

Voting for Chart No. 5 closes at 1pm on Friday 10th June 1988. Entries received after that time will not be eligible for inclusion in that month's voting. The editor's decision is final. Only one entry per individual per month will be allowed.

May 1996 to May 1997 Month 5

1000

1

Abstract

10

[illegible]

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versity of the 19th century
university thought process

and 42,000,000-50,000,000. Because
Falkenberg's demand for a 100% return
on his investment is not realistic, the

[illegible]

INTERPERSONAL is also first in its category, now ranked at **interpersonal** from **PERSONAL** **ADJECTIVE** category at the middle.

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1. **Introduction**

1. *Journal of Management Studies*, 1997, 34, 1, 1-14.

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1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

Abstract

Abstract

Don't Do It Again
Don't despair if your car is still in the shop. You've got a few options. One is to rent a car. Another is to use a car-sharing service like Zipcar, which lets you rent a car for a few hours a day. Or, you can use a car-sharing service like Zipcar, which lets you rent a car for a few hours a day.

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Dragon Aid Tape

GOOD NEWS — following the disappointment that, for a second year, Dragon owners were not to be given the opportunity to join in with the software industry's charity effort (last year *Soft Aid*, this year *Off the Hook*), it looks like we might be in with a chance after all — thanks to Christopher Bayne.

Bayne, proprietor of CB Software, is proposing to put together a compilation tape exclusively for the Dragon — and like *Off the Hook*, proceeds would go to the Prince's Trust for the rehabilitation of drug addicts. "I was annoyed last time round that we didn't get a chance; this time we've

been included again! Dragons deserve a chance," he commented.

Chris is aiming at 5-10 titles on one tape, selling for £6.95 to £9.95, depending on quantity and quality. "I've already got support from Design Design and Peaksoft, and have contacted Monsoon," he continued. "I'm looking for anything from text adventures to shoot-'em-ups, primarily commercial software — but if anyone wants to donate their own programs, we will consider them."

Chris was quick to emphasise that after costs have been recovered (primarily tape duplication and postage), all pro-



ceeds would be going to charity. "I'm not taking anything," he said. "It's all for a good cause."

■ *Dragon User* has already pledged full advertising support for the venture, so come on ... if there are any companies or individuals out there that can help CB Software put this project together, write to: 55 Ash Grove, Wetherhamstead, St Albans, Herts, AL4 8DF — or phone 058283 5915. Watch this space for developments.

Peaksoft sponsor Dragon

AS A service to the fast-growing number of Dragon owners on Microcets, Peaksoft are sponsoring Dragon news pages in *The Gallery* section — page 020000191 onwards.

The firm are also compiling a directory of Dragon owners who use the service, to help Dragon fans near and far to keep in touch. A free copy of the directory, which is updated weekly, is given to every purchaser of a modern form from Peaksoft, and to anyone who requests inclusion in the directory. Further copies, or later editions, are available in return for 50p in stamps.

Details available from Peaksoft at 44 Queen Street, Radston, Newark, Notts, NG24 3DS.

Dragon weekend

THE SECOND Dragon weekend in Wales' took place at the Tredegar Hotel in Aberdare between 21st and 23rd March. Attendance went up on last time (October 1985), with many users attending their second weekend, although the bigger venue meant that there were still a few places left unfilled.

There was a relaxed and friendly atmosphere from the start, and all types of users from the young to the not-so-young, from new tape-based 32 owners to D85 experts, enjoyed a weekend of solid 6502 computing.

Those devotees of the 5800, Compuserve, were on hand, demonstrating their new Dragon Plus expansion system, and had disk, as well as their new bulletin board software.

Many tips could be picked up simply by listening in on conversations going on around the room, from recovering corrupted disks, to linking Dragon's as intelligent terminals. Plenty of suggestions were forthcoming regarding the way the Dragon Market, and *Dragon User* in particular should go, but everyone agreed that the Dragon has a lot of life left in it yet!

It is not certain if another long weekend will be organised that's really up to you. If you want one, then write to: Mr Morgan, 16th Wales Tourist Council, Caerleon, Dinas Glyndwr, Malvern, Powys.

Micro Vision News

FOLLOWING the success of *Recreation*, their first release, Micro Vision has just announced its next game, *Talesman*. Described by a Microvision spokesman as, "a Jet Set Willy style graphic arcade adventure," plus the promise of over 100 screens, they could be on to another winner.

The game, heavily steeped in Mythology, involves the exploration of a castle (and the woods and fields beyond — if you can get out) to find a magical talisman.

If first reports are anything to go by — including your possible transformation into a frog, then back again in true fairy tale manner — it could be worth looking at. Priced at £7.95, Micro Vision expect to have the game ready for the Leeds show, so why not pop along and have a look?

For more details, contact Micro Vision at 8 Wansley Road, Liverpool, L9 6DW.

Preview

FAR, FAR into the future, the Sci Federation constructed the TIME GRID — series of neural matter used by Hyper-spaceships for faster-than-light travel. Because of the heavy traffic on the grids it was then decided to extend them. However, in doing so they encountered a sleeping Time Demon.

They carefully seeded the grids around him but were unable to stop his regeneration process.

It was then that they called on you, Time Lord, a genetically engineered Supermaid capable of travelling in the grids without the aid of a spaceship. Your task is to find the four

pieces of the Demon's Talisman, which is scattered in the grids, and use it to destroy him.

Unfortunately, the creatures will pressure has contaminated the grids.

Well ... sounds like someone's got a distinctly overactive imagination at Incentival 001, there you are — details of the scenario of *Time Lord*, their next release, (24 rooms divided into three main areas; eight different types of enemy, laser turrets, reactors ... can't wait).

Priced at £7.95, it should be available from Incentival by the middle of June. Contact them for further details at 141 London Street, Reading, RG1 4SQ, or telephone 0734 591878. Look out in *Arade Arena* for a preview, next month.



Communication

Send in your questions, requests, and plans to Communication, Dragon User, 12-13 Little Newport Street, London WC2

Problem I have recently acquired an Atari joystick and equipment to convert it to a Dragon. I would be very grateful if someone could inform me how to wire it up.

Enquirer Andrew French, 13 Parkfield, Penrhywryd, Penryn, Cornwall, NP4 3AF.

Problem I have a Dragon 32 and am very pleased with it. However, what are the pros and cons of changing to a Dragon 64 (assuming I can get one second-hand) — apart from the larger memory? Would I still be able to use my HP85 Brother printer with the 64?

Enquirer J E Lawrie, 15 Synnery Grove, Southam, Warwickshire.

Problem I would be very happy if anyone could answer a couple of questions which bother me recently. a) Could the second CPU for the Dragon 32 be any CPU or just an 8-bit one — if yes then could that be a 6802 (8-bit) one? b) Could you have a disc system without having a second CPU, and if not, what type of CPU

would that be?

Enquirer Martin Greiss, 9 Kiosco St, Galesi 11146, Athens, Greece.

Problem I have recently purchased a TRS-80 CGP-115 compatible with the TRS-80 CGP-220) four colour printer and I was wondering if anyone could tell me how I can dump the graphics screen on my Dragon 32 to the printer.

Enquirer C Carey, 57 Eastbourne Grove, Westcliff-on-Sea, Essex, SS80 3QE.

Problem I cannot obtain an O80 Programmers Manual —

has anyone got one for sale, or could I borrow a copy?

Enquirer Tony Dangerfield, 26 Lonsdale Drive, Croston, N. Preston, Lancs, PR4 7BB.

Problem Require the Dragon Games User Group Newsletter — will pay up to £1.00 in good condition. Also Dragon wings cassette — will pay up to £1.75. Please send details.

Enquirer Andrew Hill, 13 Paddy Jones Close, Forge Side, Barm, Gwent, South Wales, NP5 5TH.

Problem Wanted — Super Dragon Writer II Cartridge or

name and address of distributor. Also wanted — name of a good book on electronics for beginners.

Enquirer Gary Caruth, 130 Donaghadee Rd, Bangor, Co Down, Northern Ireland, BT20 4BH.

Problem Dragon owners in the Gosport area — I own a Dragon but don't know anyone else who does. I am very lonely!

Enquirer P J Beed, 27 Finton Road, Eton, Gosport, Hants, PO12 4EP.

Communication

Stuck for a routine? Need some obscure equipment? Feeling out of it? Fear not — someone, somewhere can help you! Write down your problem on the coupon below (make it as brief and legible as possible) together with your name and address and send it to Communication, Dragon User, 12-13 Little Newport Street, London WC2H 3PP. We'll publish it as soon as we can — meanwhile, maybe there's someone you can help this month!

Problem

.....

.....

.....

Name

.....

Address

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SMASH HITS FROM BLABY



DRAGON POWER — Capture where the real test starts! Four actions: view the game from within the safety of your dragon, but not too long — or die, then 16 options of the computer dragon. Use all changing your actions and the game. Superb sounds and graphics.

Dragon User 12-13 Little Newport Street, London WC2H 3PP



DRAGON POWER — The ultimate dragon game! You control the dragon from the start to the end. 16 actions of the computer dragon. Use all changing your actions and the game. Superb sounds and graphics.

Dragon User 12-13 Little Newport Street, London WC2H 3PP



DRAGON POWER — Capture where the real test starts! Four actions: view the game from within the safety of your dragon, but not too long — or die, then 16 options of the computer dragon. Use all changing your actions and the game. Superb sounds and graphics.



DRAGON POWER — The ultimate dragon game! You control the dragon from the start to the end. 16 actions of the computer dragon. Use all changing your actions and the game. Superb sounds and graphics.

Dragon User 12-13 Little Newport Street, London WC2H 3PP



RUNG FU — THE MASTER

After years of frustration and training you have become a Master of the first Position and now practice to what you will need to complete the game.

12-13

DRAGON POWER SUPPLIES

Available now! Send your order to the Dragon Power Supplies and you will receive your order by 12-13 Little Newport Street, London WC2H 3PP. Dragon User 12-13 Little Newport Street, London WC2H 3PP.

12-13

These games are available for the Tandy Color-32 Computer at £3.95 each.

Dragon User 12-13 Little Newport Street, London WC2H 3PP. Dragon User 12-13 Little Newport Street, London WC2H 3PP. Dragon User 12-13 Little Newport Street, London WC2H 3PP.

BLABY COMPUTER GAMES

CROSSWAYS HOUSE
LITTLEBATH ROAD, BLABY, LEICESTER
TELEPHONE: 0533-770001, TELEX: 34285 DYN-0



Arcade Hit

Program: Moon Cresta

Price: £7.95

Supplier: Incentive Software, 54 London Street, Reading, RG1 4SQ. Tel: (0734) 591579

ONE MORE go... just one more go and I'll crack it. This is something you will say a lot when you part with your hard earned pennies, in exchange for a copy of Incentive's latest release Moon Cresta. In fact you will probably say it for hours on end day after day. It's not that this game is addictive you understand, just one more go and I'll leave it alone, just one more go.

For those of you too young to remember the original arcade version of Moon Cresta, it was probably the first machine that I ever saw with a queue of people waiting to play it.

It has that marvellous quality that allows everyone to play a

reasonable game straight away but gets progressively harder the better you become. You can never say that you have mastered it, it will always get the better of you in the end.

Incentive have obtained the official licence for the game from the originators, Nichibutsu, and John Martin (the author) has produced the most faithful arcade copy that I have ever seen.

If you like the space shoot 'em up games then this must be the king of them all.

To aid you in blasting the odd eyes, zipper flies, four-eyes, meteors and atomic piles, you are given a spaceship that consists of three parts, each having its own weaponry. If you successfully manage to repel four waves of invincible aliens, then you are given the chance to dock your craft with the next section. If successful then you can double your firepower and (in theory) make life much easier for yourself. You start with just the top section of the spaceship, with only one gun, and if you dock with the



other two sections, you end up with five.

For those who think they have pretty good reactions when it comes to arcade games, if you manage to obtain a score in excess of 32,000 you will be given a secret message.

This enables you to enter a code to win a real Moon Cresta arcade machine.

OK, so it's basically straightforward 'left/right the stuff' — but if you like fast arcade action and are not frightened of spending your waking hours muttering 'just one more go' then get your wallet out and buy yourself a copy.

Ray Coates



Editor

Program: Display — Supplied on tape (Disc compatible)

Price: £3

Supplier: Panscorm Ltd, 21 Wycombe Lane, Woodson Green, High Wycombe, Bucks HP12 6AD.

Display is a quite powerful graphics editor supplied on cassette, but readily transferable to disc. Side One of the tape contains the program, plus some demonstration programs. After loading the program checks if Dragonsoft is present (by looking at where the graphics pages start in RAM) and adjusts itself to operate with tape only, or disc and tape as applicable.

The software is supplied with the usual wall written manual from Panscorm.

The basic ideas behind Display is that graphics pages can be created and edited down to pixel accuracy and then saved for use in other programs, or as character sets. The whole thing is completely menu driven in the usual Panscorm way.

The editing is done on a magnified version of the block, using the cursor keys to point to the required pixel, and then press-

ing the required colour number to fill in the pixel. It is also possible to clear the whole block to one colour for fast filling in.

Other editing functions include use of SET/PUT and copying and moving graphics pages around. Anyone who has a copy of Dragon Data's Pixel Editor (remember that?) will be interested to know that Display files are compatible with those output by it.

Supplied with the program are character sets for use in Prebyte 3, 30 columns, and Prebyte 4, 42 and 50 columns. The demonstration programs include a nice version of the 'sliding puzzle' puzzle game, which unfortunately runs rather slowly in parts (a little machine code could go a long way here!).

All of the programs are totally unpatched and would be of interest to anyone new to programming in Basic, graphics. However, the best thing about this software is its price, just £3 for a genuinely useful program, which once again shows just what skilful Basic programming can achieve.

Brian Cudge



Control

Program: Printer Control (Disk) — Dragonsoft/Cumans

Price: £20

Supplier: MacGowan Consultants, 4 Arden Drive, Capthorne, W. Gwent, Llan. NP23 3DQ

MacGOWAN'S powerful word-processor Printer Control has, at last, appeared on disc. I reviewed the cassette version back in the August '85 issue of Dragon User and gave it a 5 out of 5. All of the original functions have been kept in the disc version, these were explained in the original review, so I won't go through them all again here, but for anyone new to this program, what you get is a very powerful word-processor, (40 column screen) and a simple graphics editor.

The big difference between this and other word-processors is that MacGowan will supply a custom version to suit almost any printer (they claim to have done 87 variants so far).

So to the disc version, a four page supplement is supplied to augment the main manual, explaining the slight differences in operation. A useful, and very

necessary option for upgrading is the 'extension' program. This is loaded into the high-res pages used for the 40 column display and so does not affect any text file to RAM when called (the display reverts to 32 columns). The extension menu allows access to Dragonsoft functions such as DIR, C64-HIT, KILL, RENAME etc. It also allows loading and saving of files to cassette.

Unlike the cassette version, the disc version only runs in 32k mode, it will not access the additional 32k on a Dragon 64. A little extra programming could have made it possible to use all of the available RAM surely? Printer Control was one of the first (and only) programs to use the extra 32k on the 64.

Cassette owners will be glad to hear that MacGowan are offering an upgrade service, which depending on your printer type, will cost between £10 and £18 to replace your cassette with a disc and supplementary manual — a little expensive maybe, but at least they are offering the service to those who want it!

Brian Cudge



On-line Computing

Beginning an occasional series, *Ray Coles* takes a look at communications — starting with *Chatplus 2* and *Viewdata*

THE FASCINATING world of bulletin boards and other telephone-line-oriented information systems has been available to home-micro users for quite some time now, and Compuserve have just produced two packages which enable Dragon 64 users running Flex (and soon for DOS) to exploit just about any of these systems regardless of transmission speed or data format. The two packages are *Chatplus 2* and *Viewdata*.

Although there are many modems available on the market priced from £50 up to well over £200 the software has been written with the Demos modem in mind (although any other modem should work quite happily with this software).

Although the Demos modem is not BT approved, it is becoming more and more popular amongst the bulletin board users, owing to its excellent features per pound spent rate. Having made enquiries through many of the bulletin boards, I could not find anyone who had anything but praise for the Demos. In fact, there are some bulletin board services which actually use a Demos modem as their link to the telephone network and hence to the user!

Demon

The Demos supports auto-dialling, originate and answer modes, either Bell or European telephone standards which enables those transatlantic calls to be made (preferably on some one else's phone bill) and data transfer speeds of between 75 baud and 1200 baud.

Physically, the modem is well constructed (both inside and out, and being housed in a plastic box which is roughly the same size as a single disk drive, you won't have to fight for more table space to accommodate it).

The connections to the unit are made via flying leads which exit from the rear of the case. These are the power cable, the telephone cable, and the RS232 cable. The power for the Demos is derived from a transformer which forms an integral part of the main plug. The telephone cable is terminated in a standard BT-type phone plug, and the RS232 cable is a 9-pin 'demon'-type DIN plug suitable for a BBC computer, although a suitable adaptor is available from the suppliers Compuserve.

The first of the packages, *Viewdata*, allows a user with an appropriate modem to connect up to any of the *Viewdata* services such as the *Freefall* or *Comnet* systems which have proved so popular with BBC owners (owing to the black graphics employed by the system (BBC MicroCET)). The *Viewdata* package shows a 40x24 character display as used by Prestel and the character set contains all the necessary

block graphics to display the Prestel pictures. Even though the Dragon's limited display capabilities restrict this package to two colour operation, the effect is very impressive. The package allows the user to save, review and print frames from whichever system is being used. Flex commands may also be passed to the DOS for processing whilst the *Viewdata* package is in use.

Chatplus

The *Chatplus* package is a very comprehensive communications package with a multitude of options to allow connection to either bulletin boards via the BT network or to another Dragon (or any other RS232 computer system) using receive and transmit speeds of between 75 baud and 18000 baud. The data format (start/stop bits, number of data bits, parity, etc.) is completely variable, with the most common settings being held ready at the press of a key. The default settings on installing the program were used quite happily with all bulletin boards accessed for this review.

Like *Viewdata*, *Chatplus 2* allows auto-dialling for either data or voice calls. This feature is enhanced by the use of an on-line telephone directory which utilizes a text file stored on disk containing the names, phone numbers and all the setting up details required for every entry, so that by simply typing the name of the bulletin board or person that you wish to contact, *Chatplus 2* will retrieve the setting up details and phone number from the disk file, phone the chosen number, and either put you on-line or prompt you to pick up the phone without any intermediate user intervention. For the sensitive amongst us, *Chatplus 2* has an option which allows bulletin board passwords, etc. to be protected from prying eyes by substituting an asterisk (*) for each character typed until the <ENTER> key is pressed.

Because the flow control may be toggled between either the DTR or X-ON/X-OFF forms of protocol, *Chatplus 2* allows the Dragon to be connected directly to all sorts of other computer systems. For the purpose of this review a Dragon 64 was connected directly to another Dragon 64 and information passed back and forth with no error at 9600 baud. Connection was also made to both a DEC-VAX-11/780 cluster running under the VMS system and a DEC PDP-11/34 system running under RSX-11-M. Again information was passed back and forth at 9600 baud and at 1200 baud with no errors.

The only problem with using a Dragon on a main-frame system is that of terminal emulation. Most mainframes expect the user to be using a specific type of terminal in order to utilize screen editors and applications packages. Maybe a few terminal

emulation packages could be made available? (*Chatplus 2*??).

The ability to go-load and download files enables information and programs on the bulletin board systems and mainframes to be down-loaded into the Dragon's memory or on to the Dragon's disk, and files already held on the disk may be up-loaded to the file area on the host system.

Compuserve have also written a program designed to run either as a stand-alone package or from within the *Chatplus 2* program. It allows the transfer of data to or from the Dragon, using the XMODEM protocol found on many of the bulletin board services. I have only had time to use this software once to upload and download a program living from a bulletin board and this worked with no problems encountered. The XMODEM standard of data transfer includes a checksum routine, which means that all incoming data is checked for validity before being stored. If an error is detected then the block is re-sent until either the data received is correct or the transfer fails more than a specific number of times. (This may be printed by the user.)

In conclusion, all the features of both software packages and the Demos modem worked as advertised. The software was fast, easy to use and reliable. If you have a modem and can stand the phone bill then you can't really go wrong with either of these packages — but you'll need a 64 running Flex, remember.

Extras

The only additional cost, for those who wish to access it, is the membership fee for the Prestel service. This is some £18.50 a quarter, but is good value if you are going to use it regularly. Prestel is only a local call and there is an incredible amount of constantly updated information available to its users. Everything from the latest news and weather to Mailbox systems, second-hand car sales, photography hints and tips, etc. etc.

Finally I would like to thank the Royal's of all the bulletin boards that I have accessed whilst testing the software for this review. In particular the Tandy Users group bulletin board (TUXO), REACT, and the Liverpool Mailbox BBS. (The numbers for these are 01-520 7577, 0378 518815 and 051-428 0824 respectively.)

Hardware Demos Modem (Not BT approved)

Price £28.00 + p&p

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Jaws!

Just when you thought it was safe to go back to the keyboard...
arcade action from **Steve Gattuccio**.

IMAGINE yourself as a scuba diver out hunting fish. All you have to do is shoot the fish with your spear gun using the **ENTER** key. There are three fish, two of which are moving up and down, but the third fish is coming towards you and you must not let it reach your side of the screen else you will lose a life. You score 100 points for the fish moving down, 80 points for the fish moving up and 40 points for the fish moving towards you. There is also a random chance of an extra score — this happens if the fish coming towards you 'bumps' into any of the other fish you will score whatever the fish bumped into is worth. (After practice you can learn how to make this happen).

Shark

However, life is never that simple and you find that your lead boots are too heavy so you have to keep pressing the **UP** **ARROW** key to stop yourself falling — also after a random amount of time a very nasty Shark appears. You are frozen stiff with fright unable to move or shoot and your only chance to drop a depth charge on to the nose of the Shark. The depth charge is located at the top of the screen and is released by pressing the **ENTER** key, you must hit the Shark just in front of or on the nose, else the charge will not explode. If you hit the Shark you gain 1,000 points, if you miss, the Shark will come straight for you and eat you. (This is not a pretty sight).

The game is in **MODE 3**, uses bit movement for smooth graphics, several sound routines and has a simple hall of fame at the end. To enter the game proceed as follows:

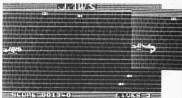
First type in **LISTING 1** this is the fastloader, (as previously printed). Once RUN you will be asked for the start address, this is 26000. Type this in, press **ENTER** and you will be asked for the finish address, this is 31518. Type this in, press **ENTER**, and you must now type in the last row of 16 digits up to but not including the = sign. **LISTING 2**. Press **ENTER**. You must now type in the checksum, this is the number in the column after the = sign. Type this in and press **ENTER** — if all is well the next address will be displayed. To save the whole game to tape use **CSAVEM "JAWS" 26000,31518,26000**.

If you want to type in **LISTING 2** in small parts, then when asked for the finish address type in the address you want to

finish at, then when you get the 'OK' sign add to tape using **CSAVEM "JAWS" 26000-N,26000** where 'N' is the finish address you specified. Don't forget to **CLOADM** each just before running the fastloader next time. Each time you restart you use the finish address you

specified last time as you start address.

To run the game type in **EXEC 30000** if you have any problems, (with computing), contact me at 18 Hankinson's Flat, Watpole St Andrew, Wiltshire, Gwent, TNA PD14. Also I can supply a copy of the game for £1.50 which will include software. Good luck!



Listing 1

```
10 CLS
20 REM HEXLOADER - ENTER THE
30 REM STRING OF HEX DIGITS FIRST
40 REM AND THEN THE CHECKSUM
50 CLEAR200,27999
60 PRINT"ENTER START ADDRESS":INP
UT START
70 PRINT"ENTER FINISH ADDRESS":IN
PUT FINISH
80 FOR N=START TO FINISH STEP 11
90 PRINTN;" ";
100 TT=0:INPUT A$:Z=0
110 FOR Q=1 TO LEN(A$) STEP 2
120 P=VAL("0"+MID$(A$,Q,2))
130 TT=TT+P:P=POKE 0N+2,P
140 Z=Z+1:NEXT
150 PRINT" = ";
160 INPUT T$
170 IF T$ <>HEX$(TT) THEN SOUND 20
,30:PRINT"ERROR - ENTER LINE AGAIN
":GOTO 100
180 NEXT
```

Listing 2

20000	14042F00000000000000000000000000	= 4F	20044	00000000000000000000000000000000	= 0
20011	00000000000000000000000000000000	= 0	20045	00000000000000000000000000000000	= 0
20022	00000000000000000000000000000000	= 0	20046	00000000000000000000000000000000	= 0
20033	00000000000000000000000000000000	= 0	20077	00000000000000000000000000000000	= 0
			20088	00000000000000000000000000000000	= 0
			20099	00000000000000000000000000000000	= 0

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29476	1D17FF6017FF1717FF1E17	=	383	38136	FC398E600A0E18F6D0A0C	=	578
29485	FF2517FF23CF6D8E188E04	=	469	38167	800122041827829FF66D7E	=	334
29496	68188FF60421400700C08E	=	451	38178	C1801827FC071602853436	=	442
29507	251A17FEE617FEF517FEFC	=	455	38189	8E6D79180E60980095C1F	=	487
29518	17FF038F6D8E188E044B18	=	439	38200	17FA353000000F60790C00	=	517
29529	8F6D6316000000C0901825	=	388	38211	9022040E164FF0F6079100E	=	506
29540	001717FEC517FEED17FEED	=	506	38222	6E5F17FA1817002F350634	=	369
29551	8F6D6090188E04E0180F6D43	=	468	38233	348E6D78180E60700605C6	=	410
29562	1400900C6072251317FEA9	=	904	38244	15F17FA000000200F60700C	=	443
29573	17F0000FF659218000002A19	=	968	38255	1436270000000000F6D7010	=	381
29584	8F6D63207200C094251017	=	300	38266	8E4E5F17FF0F017004C35006	=	449
29595	FE718F6D94180E0400180F	=	520	38277	3436D6D7930000FC607A6	=	518
29606	606320180C6D942540180E	=	300	38288	040180200030000200A20F	=	377
29617	6540180F6D636F6D9617FE	=	526	38299	3506006D79180E6D700A40	=	900
29628	480060E7180E7305A00007	=	640	38310	6C1F17FC500E164FF6D079	=	552
29639	00180C73F526F6006000001	=	564	38321	C0400000160F6D0017FF21	=	920
29650	5918270000019C18270000	=	204	38332	301F17FF055A20F28E0D04	=	454
29661	17000217FC0E23E941404F	=	381	38343	30002300F6D00A20C3430E	=	445
29672	34000035260470F6000504F	=	389	38354	6D700000FC400A0040100	=	476
29683	4E6700011717340002193013	=	190	38365	34000000200A20F435000E	=	423
29694	1400160520070114000012	=	8F	38376	6D70180E6070000005C61F17	=	413
29705	030F0C050E04000FF00C036	=	246	38387	F7000000000F6D70C0400E	=	520
29716	8E6D63C0A03010A00A0000	=	490	38398	00300F6D0017FEED730F17	=	436
29727	A7005A26F71701763500034	=	440	38409	F0125A26F20E6D0A300023	=	30F
29738	3006FF230A0007FF230000	=	507	38420	8F6D0A20C3436180000004	=	340
29749	01004FDB7FF2000167FFF20	=	590	38431	8E1C77C607000430A70A30	=	406
29760	0011300018C000F25E000FF	=	520	38442	015A26F62000190C1D7025	=	393
29771	23004F707FF2335001F1231	=	404	38453	EC17FD06013F1800000026	=	362
29782	3F23FC07343006D760101	=	418	38464	0EF66D700000C030F041F	=	55F
29793	270F00000401002600170F0	=	349	38475	020E1C7000000C61F17F31A	=	306
29804	4700018700735003430006	=	473	38486	000634361304000001C0FE	=	309
29815	60670011A25154FB76D7007	=	440	38497	8E6D6F3000317FE00001F17	=	383
29826	6069180C6D90006D470003	=	494	38508	F6463001F17FE013001F17FE	=	400
29837	002017FD923500630A0000	=	502	38519	5C201F17FE7570A20F0E00	=	491
29848	700101272316000060000E	=	417	38530	6F20000000F6D0F5A20D130	=	463
29859	606005C61F17FE0000970E	=	556	38541	09FC000F606FF60D750AF7	=	700
29870	F60116C10F2002C60F0620	=	47F	38552	6D70261C0A00F76D700E6D	=	4F0
29881	30C300950F60604030003436	=	493	38563	6F301F000FF66D715C0F70D	=	40E
29892	F60D70C101271C0E6D6D10	=	460	38574	71702500F6D4F250063436	=	464
29903	0E6E0F0E05C61F17FE057006	=	480	38585	F66D71C1122510006D0F30	=	466
29914	01876D70C600F76D7005FF7	=	57E	38596	1F18000C0A0000C62017F0	=	474
29925	6D7F300034361306001C0E	=	439	38607	01250600F3007FC007FFC5	=	000
29936	8E6D6D1700900E1F1700099	=	34C	38618	07FFC700FF2200070AF007	=	710
29947	8E6D6D30002000F6D00A00	=	409	38629	FF220E06000AF7000C1000	=	305
29958	E73000FF600F606D606D74	=	66F	38640	20F00E0400C2000FFA700	=	544
29969	5AF76D702636C000F76D74	=	554	38651	50A20F3000A400C0006A250F	=	470
29980	F66D705CF76D70FC1192511	=	531	38662	100E6D700E0000000C620	=	454
29991	5FF76D70F76D70F66D705A	=	65E	38673	17F050000231A01A100C0E	=	30E
30002	F76D701701A18E6D6D301F	=	002	38684	10E000C1C200C2000FFA7	=	50F
30013	8F6D6D0F700F6D6D116C17D	=	506	38695	009A20F700000000010E125	=	400
30024	223700E60D180E6D900A05	=	600	38706	0F100E6DFA00E1C6200000C6	=	530
30035	C61F17FE0030000000C100F	=	40B	38717	1F17F02F3000131201000C0F	=	2F2
30046	250330000C00F6D6D100E6E	=	445	38728	FC200FF00C1C7710000AF0C17	=	552
30057	5F17FA03050000006D6D100E	=	554	38739	F010031200001000F70A236	=	2F3
30068	6D7000605C61F17FA030000	=	4F1	38750	F31000F0000E1C0017F007	=	44C
30079	C00C000FF220300000000F6D	=	47C	38761	20010C1C6020F6100000F70C	=	40C
30090	6D100E6E5F17FA09E20D9304	=	404	38772	0E1C7D717F7FA00000000F6D	=	595
30101	34E604050E70043500343000	=	56F	38783	600E12000FF6D650E164FF0F	=	40E
30112	FF230A0007FF233000001006	=	4A2	38794	6D700000000F6D70C600AF7	=	590
30123	F007FF2000167FF200011	=	502	38805	6D72C600F76D754FB76D73	=	56C
30134	20010C0A00002000000F2004	=	500	38816	076D70076D71076D770000	=	50F
30145	F707FF2330001F12313F36	=	002	38827	700760A0076D70076D7070E	=	505

Changing bases

Part Four of our machine code series — this month Jason Orbaum looks at Numerology

HELLO, and welcome to Part Four of the series that looks set to make 'War and Peace' look like a pantheist. And there is something very different about this month's tutorial... Yes, I'm writing it in the first person singular. There's a very good reason for this.

About three weeks ago Geoffrey came into my room at about eight o'clock and said: "I hope you don't mind Jason, I used your toothbrush."

"I'm sorry Geoffrey," I replied, "but I do object actually because you have plaque and gum disease and lots of other horrible things like that."

"That's all right," he said, "I used it to clean my shoes."

Office is to say that Geoffrey is now seeking new accommodations, but will return in a conditional branch next issue!

And so to work. Firstly an apology. We promised "a complete explanation of the assembler directives, full coverage of addressing modes and a tutorial on the branch instructions," last month, but in fact these things will follow in later articles. This month there are some more important things which it occurs to me need explanation, namely, base numerology (as pronounced) memory organisation, and the precise meaning of single and double precision.

Numbers

Firstly then, base numerology. The way I intend to teach it is the way I myself was taught. Although the next few paragraphs may appear patronising and an insult to the intellect, they are written assuming a total lack of mathematical knowledge, as base numerology simply must be understood if machine code programming is to be achieved with ease (it is quite possible to program in decimal only, but what about reading dis-assembled code or writing in a way where the numbers actually mean something)?

The base numerology lesson runs thus:

1) We live on a planet where the dominant species is the human being. Humans in general have ten fingers. Therefore, the best counting system to use is one which works in multiples of ten: one in base ten (known as decimal).

2) We therefore have ten digits (zero to nine) which can be used to describe any real, rational, non-infinite number.

3) A number is arranged in columns each of which stands for a multiple, or to be more precise, a POWER of ten. The powers of ten are more clearly explained in the following table.

- 10⁰: Ten to the power zero: 1=1
- 10¹: Ten to the (power) one: 1.10=10
- 10²: Ten squared: 1.10.10=100
- 10³: Ten cubed: 1.10.10.10=1000

- 10⁴: Ten to the four: 1.10.10.10.10=10000
- 10⁵: Ten to the five: 1.10.10.10.10.10=100000

and so on up until ten to the power infinity which is a number too big to represent (NB in this table the dot represents a multiplier, ie, 10.10 = 10 × 10 = 100).

We can see that 1 is written to the power 'X' where X is any number between zero and infinity we simply write a one with X number of zeros after it. Very simple really! So what use is it?

1) Any number can be written in words (even in three standard ways, which are the ways the number can be spoken. Thus the number 12 can be written as 'twelve' or 'one lot of ten and two units' or 'one lot of ten to the power one and two lots of ten to the power zero'). The last is both the most useful and the most appropriate to base numerology of the three. The reasons for this require demonstration thus:

Demo

Take this number: 1190085129. It can be expressed in each of the three ways:

A) "One thousand one hundred and fifty nine million three hundred and ninety five thousand one hundred and twenty nine."

B) "One lot of a thousand million, one lot of a hundred million, five lots of ten million, nine lots of a million, three lots of a hundred thousand, nine lots of ten thousand, five lots of a thousand, one lot of a hundred, two lots of ten and nine units."

C) "One lot of ten to the nine, one lot of ten to the eight, five lots of ten to the seven, nine lots of ten to the six, three lots of ten to the five, nine lots of ten to the four, five lots of ten to the three, one lot of ten to the two, two lots of ten to the one and nine lots of ten to the zero."

Description (C) can be re-written in figures thus: 1190085129=1.10⁹+1.10⁸+9.10⁷+5.10⁶+8.10⁵+1.10⁴+2.10³+9.10²

It is arguable which of the word descriptions are easiest to get to from the original number, but it is obvious which word description is easiest to reach the number from.

1) Let us now imagine a planet where the dominant race is a species with only eight fingers. The best system for them to use would be one that works in multiples of eight. The base eight system (known as octal). This system has eight digits (zero to seven) and any real, rational, non-infinite number can be represented within it.

2) Every octal number is arranged in columns each of which stands for a power of eight thus:

- 8⁰: Eight to the zero: 1
- 8¹: Eight to the one: 1.8=8
- 8²: Eight squared: 1.8.8=64
- 8³: Eight cubed: 1.8.8.8=512
- 8⁴: Eight to the four: 1.8.8.8.8=4096
- 8⁵: Eight to the five: 1.8.8.8.8.8=32768

and so on up to eight to the power infinity which again is a number too big to be written down.

3) Any number in octal can be written down in words in one of three ways. Again these are the ways the number can be spoken. Thus the number 129 where the subscript represents the base can be written as "One two base eight", or "One lot of eight and two lots of units", or "One lot of eight to the power one and two lots of eight to the power zero."

The advantage of the last method must again be shown by example: 347621.

- A) "Three four seven six two one base eight."
- B) "Three lots of thirty two thousand seven hundred and sixty eight, four lots of four

Conversions from Binary to Decimal

Pick a number. Any number. Say 11510110 binary.

To convert this to decimal, we make use of the fact that, working right to left, each digit represents rising powers of two.

Therefore our binary number is:

$$(1 \times 2^7) + (1 \times 2^6) + (1 \times 2^5) + (0 \times 2^4) + (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (1 \times 2^0)$$

We can disregard all zero digits, giving:

$$(1 \times 2^7) + (1 \times 2^6) + (1 \times 2^5) + (1 \times 2^3) + (1 \times 2^0)$$

Multiplying out the powers of two gives:

$$(1 \times 128) + (1 \times 64) + (1 \times 32) + (1 \times 8) + (1 \times 1) = 233$$

or

$$2 + 4 + 16 + 64 + 128 = 233$$

The powers of two are 1, 2, 4, 8, 16, 32, 64, 128 and so on, so it becomes fairly easy, with practice, to scan a binary number and work it out on the go.

Conversions from Hex to Decimal

The principle here is the same as for binary, except that we are using powers of sixteen:

$$59C = (5 \times 16^2) + (12 \times 16^1) = 144 + 12 = 156$$

thousand and ninety six, seven lots of five hundred and twelve, six lots of sixty four, two lots of eight and one unit."

C) "Three lots of eight to the five, four lots of eight to the four, seven lots of eight to the three, six lots of eight to the two, two lots of eight to the one and One lot of eight to the zero."

Provided we can work out powers we can easily convert from version (C) to version (B), and from there to decimal. The maths would look like this:

$$347021_8 = 3 \cdot 8^5 + 4 \cdot 8^4 + 7 \cdot 8^3 + 2 \cdot 8^2 + 1 \cdot 8^1 + 0 \cdot 8^0$$

$$= 3 \cdot 32768 + 4 \cdot 4096 + 7 \cdot 512 + 2 \cdot 64 + 2 \cdot 8 + 0$$

$$= 98304 + 16384 + 3584 + 64 + 16 + 0$$

$$= 128672_{10}$$

The ten subscript can be dropped, as any number without a subscript is assumed to be in base ten in mathematics.

From here we can generate:

B) Let us imagine a planet where the dominant species is a creature with Q fingers (where Q is any positive whole number above one). Here, the simplest system of counting to use would be one that works in multiples of Q. The base-Q system. There are Q digits (zero to Q-1).

(a) The numbers in base Q are presented in columns each of which represents a power of Q. The powers are calculated thus:

Q⁰: Q to the zero: 1
 Q¹: Q to the one: 1.Q=Q
 Q²: Q squared (or Q to the two): 1.Q.Q
 Q³: Q cubed (or Q to the three): 1.Q.Q.Q
 Q⁴: Q to the four: 1.Q.Q.Q.Q
 and so on up to Q to the power infinity which is a number too big to be written down.

Any number in base Q can be written in two ways; thus 123, can be written "One two base Q" or "One lot of Q to the one and two lots of Q to the zero"

(b) To convert from base Q to decimal the maths is worked out thus:

$$12341_8 = 1 \cdot 8^4 + 2 \cdot 8^3 + 3 \cdot 8^2 + 4 \cdot 8^1 + 1 \cdot 8^0$$

$$= 1 \cdot 4096 + 2 \cdot 512 + 3 \cdot 64 + 4 \cdot 8 + 1 \cdot 1$$

$$= 4096 + 1024 + 192 + 32 + 1$$

$$= 5345_{10}$$

We cannot continue from here satisfactorily without knowing what Q is.

Lesson

Thus ends the lesson in Pure base numerology. Now comes its application. Fortunately when computing we need not work in terms of a base of an unknown constant (ie base Q) but using the structure of the constant enables us to work in any given base. The two bases most commonly used in computing are Binary (base 2) and Hexadecimal (base 16).

Binary is used because this is the base that a computer "works" in. As has been explained before a computer circuit can be in one of two states at any given time. It can either be on or off. These states are represented mathematically by the digits 1 and 0. Thus, when designing a picture in PMODE 4.1 any particular pixel can be black or white (or green in SCREEN 1). Thus if we take eight pixels which are alternately on and then off a binary representation of them would be:

10101010, = 170

(The number is represented to the assembler by use of the Prefix "B" which tells the assembler that this test number is in binary, ie %10101010)

And by an amusing non-coincidence, to produce this exact pattern in the top left of the screen in this mode we simply PMODE location 1004 with 170. More of this much later when we come onto graphics. Base two is used also for mathematical work as we shall see in two months' time.

Hexadecimal uses sixteen digits they are, in ascending order, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F. Thus a hex (short for hexadecimal) number can look like this: 345678

or, in assembler language, (PMODE) with the dollar sign (on Sinclair at least) telling the assembler that the next number is in hex. The reason we program in hex is that it is very easy to convert from binary to hex, and it is easier to use when visualising patterns. Conversion from binary to hex is incredibly easy, all that is needed is the following table:

Decimal	Binary	Hex
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

It is clear that %1111 is the highest number possible with four binary digits, or bits (a nibble, remember?) and that FF is the highest number possible with a single hex digit. Thus a byte, composed of eight bits can always be represented by two hex digits. To convert is simply itself. Simply split the binary number into groups of four adding zeros to the beginning of the highest cluster thus:

a) %101101 splits to %1000 and %1101
 %0010 = 2
 %1101 = 5
 thus %101101 = 25D
 b) %101110110101 splits to %10010,
 %1110, %1101 and %1001
 %0010 = 2
 %1110 = 6
 %1101 = 5
 %1001 = 9
 thus %101110110101 = 2659D

This is not really into single and double precision. They are now very easy to explain. Simply, a single precision number can be held in one byte and thus represented by up to eight digits in binary (up to two digits in hex) and a double precision number can be represented by between nine and sixteen digits in binary and either three or four digits in hex.

And so, finally, to the organisation of

memory which must be discussed to enable stored programming. Basically, we can think of memory as a long timeline of boxes placed next to each other (yes, I know it's a cliché, but why do you think it's a cliché - because it's a very good description)

Each of these boxes can hold a single precision number, ie an integer between -5.0 and 5.11111111 or 32 and 3FF or 3 and 255 inclusive. In the Dragon there are 7111111111111111 or 3FFFF or 65536 boxes although half of them (from 32768 onwards) have been locked with a set number inside that cannot be changed - we are in ROM. The first 32768 (from 0-32767) can have the number within them changed at any time by the programmer.

0-3FF	Systems Use
0FF	Direct Page RAM
3FF	Extended Page RAM
400-5FF	Text Screen Memory
600-3FFF	Graphics Screen Memory
3800-7FFF	Program & Variable Storage
8000-8FFF	Basic Interpreter
C000-EFFF	Cartridge Memory
FF00-FFFF	Input/Output
FF60-FFFF	SAM Control Bits
FFD0-FFFF	MPU Vectors

If a double precision number is stored at a location the high byte (the first eight binary digits when zero have been added on to the front make the number of binary digits up to sixteen and hex digits up to four) is stored at that location and the low byte (the remaining eight binary digits or four hex digits) is the next location.

Fig. 10 store %1110001100 (300E) in location 1004, location 1004 will contain %00000011 (000D) and location 1005 will contain %10001110 (080D)

Revision

I hope that this month's article (which has diverted somewhat from "the practical course") has helped to clear up any problems that existed about the basics of programming. From here onwards all the terminology used in this tutorial will be assumed understood and used frequently without explanation in future parts. To briefly run down what has been assumed understood (base notation in mathematical and assembler form, the exponential or power theory, single and double precision numbers, Memory arrangement, Mathematical notation for multiplication, conversion from any base into decimal, conversion from Hex to Binary and vice versa. Got that?

Next month, an explanation of the Branch instructions and an introduction to dry running. If there is anything you do not understand that has been covered please write to the usual Dragon User address, and maybe I can help.

I must go now, there's someone at the door about naming Geoffrey's son!

Graphic Display

Printing text on the graphics screen — all is revealed by Peter Whittaker

FOR a long time I have been bored with the Dragon's black on green display, and so eventually got around to doing something about it. I wanted to write a routine which would allow printing on both the usual green text screen, and the orange alternate screen. It also had to print text to the PMODE4,1 graphics screen, in a variety of different ways, to allow the mixing of text and graphics. Lastly, it was not to interfere with the normal running of the computer, so that tape and printer operations would still function normally.

The end result was 'Grafted', which resides in memory from 29000. This program will intercept the Dragon's print routine and replace it with its own. This means that all text messages can be displayed on the graphics screen, and not just deliberately printed strings.

Graphics

There is no need to display the text screen for anything at all. The Dragon becomes a true graphics machine, with error messages and loading program files being displayed on the graphics screen. It is even possible to program the Dragon from the graphics screen.

First, CLEAR 200,29000, then Enter and RUN the loader program (Listing #1) and then type in the code for 'Grafted'. When this has been saved to tape, BASIC 29000 is installed the routine. The screen will switch to graphics, and display the Copyright message. The CLG command and the <CLEAR> key have been redirected to also CLG the graphics screen. The routine is completely transparent to Dragon Basic.

To change the display screen just use the SCREEN command (SCREEN:0 or SCREEN:1 etc). Another noticeable feature is that the graphics screen can be displayed by a simple SCREEN:0 command. The display does not revert to the text screen when the computer prints its 'OK' prompt.

There are several special functions written into Grafted to give greater control over the printout. These are all called from the PRINT CHR\$(n) command (Table #1 gives a full list.)

CHR\$(0) — disconnects the routine. The program still remains in memory, and can be reloaded by CHR\$(20000), but will not interfere if other routines want to be run (eg, DASH assembler cartridge).

CHR\$(1) — stops the routine from printing on the graphics screen. Text will still be displayed on the text screen, and commands can still be entered from the keyboard, but they will not be listed on the graphics screen. This will stop the computer from printing ugly messages over great works of art on the graphics display.

CHR\$(2) — reconnects the graphics print routine.

CHR\$(3) — turns the graphics screen scroll routine off. Text will be printed down the screen as usual, but when the bottom line is reached, the screen will not scroll and the bottom line will be overprinted again and again.

CHR\$(4) — reconnects the scroll routine.

CHR\$(5) — causes the print to be filled with the background before printing. Text will be white on black or white on white (invisible). When printing in this mode, text will not destroy the graphics it prints over.

CHR\$(6) — causes the print to delete its background when printed. Any graphics will be scrubbed out. Print is again white on black, but if the background is white the text will still be white in a black surround. Graphics can of course be drawn over this text once printed.

CHR\$(7) — will cause the text to be SCHEW with its background before printing.

This has the effect of producing a white print on a black background, or a black text on a white background. Any underlying graphics are not destroyed.

CHR\$(8) — will call the code for a background.

CHR\$(14) — changes the background colour from black to white. It also scrolls the background, the CLG command and the scroll routine. It will also select the SCR text of CHR\$(7) so that the print can be seen on the white background.

CHR\$(15) restores the standard black background, undoing the effects of the CHR\$(14). However, it does not change the print type (3-7).

'Grafted' comes complete with its own predefined graphics character set. These can be redefined by FORKING the appropriate codes into memory. Listing #2 is a program to do just that. When run, the program will display the letter 'T' and wait for a prompt. Pressing the <Shift> key with either the up or down arrow key will cause the program to display the next letter above or below. In this way the whole character set can be examined at leisure. To find a letter quickly, press the <CL> key, and the program will then ask which letter to display. Pressing the <4> key will allow you to select a character by its ASCII code (eg. 65=A, 66=B, etc). Pressing the <Q> key will quit the program.

When the program runs it displays each graphics character in a large grid to the left of the screen. If the character is not the desired shape, press the <X> key to substitute it. The computer will then prompt for 12 string inputs on the right hand side of the screen, opposite the graphics character. Each input should be eight characters long, and be comprised of a series of ones

- | | |
|----|------------------------|
| 0 | - DISCONNECT |
| 1 | - PRINT OFF |
| 2 | - PRINT ON |
| 3 | - SCROLL OFF |
| 4 | - SCROLL ON |
| 5 | - PRINT 'OK' |
| 6 | - PRINT !! |
| 7 | - PRINT 'EOR' |
| 14 | - SET WHITE BACKGROUND |
| 15 | - SET BLACK BACKGROUND |

Table 1

```

10 'HEX LOADER FOR 'GRAFTEXT' ROM
  Y DUMP, BY PETER WHITTAKER
20 START = 29000
30 FINISH = 32000
40 FOR N=START TO FINISH STEP 8
50 PRINT N;"; ";
60 TT=0:INPUT AB:Z=0
70 FOR M=1 TO LEN(AB) STEP 2
80 L=VAL("&H"+MID$(AB,M,2))
90 TT=TT+L*POW(256,L)
100 Z=Z+1:NEXT M
110 PRINT": ";
120 INPUT T
130 IF TT<TT THEN PRINT"error" = ENT
    ER:LINE ADDR="G0T000
140 NEXT N
    
```

Listing 1

29176	3628423315554554	505	29488	32988333333333333333	37
29184	43523232748435454	503	29496	83333333333333333333	8
29192	41484352333333333333	358	29794	88888888333333333333	3
29200	66333427333333333333	447	29712	23333331451433333333	63
29208	33333313133146678	383	29720	33333333333333333333	4
29216	8773333143337331	388	29728	14365141433314143333	23
29224	877333331333331333	789	29736	33333333333333333333	17
29232	6333318333143331	587	29744	33333333333333333333	63
29240	87733333333377256	1155	29752	33333333333333333333	33
29248	66266772576683332	887	29760	888888888182333313	11
29256	633331833333333333	324	29768	33333333333333333333	3
29264	877333333333333333	738	29776	33333333333333333333	24
29272	233333333333773332	633	29784	88888888888888888888	88
29280	633331833333333333	646	29792	23333333333333333333	38
29288	877333333333773331	1153	29800	33333333333333333333	32
29296	83333324333186336	317	29808	33333333333333333333	78
29304	833331333773348773	389	29816	33333333333333333333	3
29312	33333333333333333333	632	29824	33333333333333333333	34
29320	263333333333773331	333	29832	33333333333333333333	3
29328	843773333333333333	660	29840	33333333333333333333	34
29336	33333333333333333333	611	29848	33333333333333333333	62
29344	81678731633781333	739	29856	33333333333333333333	3
29352	433333333333433333	614	29864	88888181888888888888	48
29360	877333333333773331	1151	29872	888182848881828488	141
29368	877333333773333333	1159	29880	8888888881C33333333	33
29376	26333333333333333333	631	29888	23333333333333333333	13
29384	877333333333773331	852	29896	88188888888888888888	11
29392	877333333773333333	1151	29904	8888888881C33333333	68
29400	33333333333333333333	637	29912	33333333333333333333	141
29408	34133333333333333333	872	29920	1C333333333333333333	113
29416	33333333333333333333	623	29928	88888888888888888888	72
29424	833333333333773331	1063	29936	33333333333333333333	75
29432	1213337333333333333	612	29944	33333333333333333333	23
29440	33333333333333333333	639	29952	88888888888888888888	123
29448	88333333333333333333	837	29960	23333333333333333333	134
29456	28833333333333333333	664	29968	33333333333333333333	141
29464	33333333333333333333	363	29976	8888888881C33333333	136
29472	12133333333333333333	422	29984	23333333333333333333	123
29480	88888888888888888888	343	29992	1C333333333333333333	188
29488	83333333333333333333	537	29996	88888888888888888888	9
29496	33333333333333333333	737	29998	88888888888888888888	9
29504	23333333333333333333	563	29999	88888888888888888888	24
29512	FF333333333333333333	673	30004	18233333333333333333	18
29520	33333333333333333333	658	30032	18888888888888888888	28
29528	83331473333333333333	434	30040	88888888888888888888	184
29536	1C48F888888888888888	576	30048	88888888818888888888	3
29544					

30200	0222221C00000000=	30	30720	0000000000000022=	34
30205	222+200020242222=	302	30725	2214140000000000=	32
30210	0000000000000000=	120	30730	0000002222220014=	172
30224	2222200000000000=	130	30744	0000000000000020=	34
30232	2222200000000000=	316	30750	1400142200000000=	02
30240	0000000022222200=	160	30760	000000242+24241C=	172
30240	2222222200000000=	140	30760	04041C0000000030=	30
30250	1C2222222222221C=	200	30770	0400103C00000000=	90
30264	0000000000C222220=	100	30784	0004000010000004=	26
30272	2000000000000000=	120	30792	0000000000000000=	54
30280	1C222222220000410=	204	30800	0000000000000020=	24
30280	0000000000C222220=	102	30800	001000000+000010=	60
30296	3C202+2200000000=	170	30810	000000000000122C=	02
30304	1C22201C0200221C=	100	30824	0000000000000000=	0
30312	0000000000000000=	07	30840	0000000000000020=	0
30320	0000000000000000=	32	30840	0000000000000000=	0
30320	222222222222221C=	306	30850	0000000000000000=	0
30336	0000000022222214=	122	30850	0000000000000000=	0
30344	1414000000000000=	06	30864	0000000000000000=	45
30352	2222222000000000=	300	30872	0000000000000000=	1440
30360	0000000022214000=	96	30880	0000000000000000=	700
30368	0014222000000000=	96	30880	0000000000000000=	040
30370	2222140000000000=	120	30890	0000000000000000=	30
30384	0000000000000000=	77	30904	0000000000000000=	120
30392	1000200000000000=	140	30912	0000000000000000=	120
30400	3E30000000000000=	412	30920	0000000000000000=	1470
30400	0000000000000000=	40	30920	0000000000000000=	040
30416	0004000000000000=	14	30930	0000000000000000=	120
30424	3000000000000000=	160	30944	0000000000000000=	400
30432	00000000000014220=	62	30952	0000000000000000=	1240
30440	0000000000000000=	0	30960	0000000000000000=	1240
30440	0000000000000000=	62	30960	0000000000000000=	1920
30456	0000000000000000=	20	30970	0000000000000000=	1960
30464	0000000000000000=	0	30984	0000000000000000=	2040
30472	00001C041C040410=	150	30992	0000000000000000=	310
30480	0000000000000000=	140	31000	0000000000000000=	1320
30488	2222220000000000=	162	31000	0000000000000000=	1320
30496	0000001E2000001E=	150	31016	0000000000000000=	1900
30504	0000000000000000=	02	31024	0000000000000000=	2040
30512	2022221E00000000=	130	31032	0000000000000000=	700
30520	0000001C2220201C=	102	31040	0000000000000000=	0
30520	0000000000000000=	46	31040	0000000000000000=	40
30536	0010101000000000=	104	31050	0000000000000000=	40
30544	0000001C22210000=	120	31064	0000000000000000=	1440
30552	00001C0000000000=	172	31072	0000000000000000=	700
30560	2222220000000000=	102	31080	0000000000000000=	040
30568	000000100000001C=	04	31080	0000000000000000=	30
30576	0000000000000000=	4	31090	0000000000000000=	120
30584	0004040404140000=	44	31104	0000000000000000=	120
30592	0000000400000000=	204	31112	0000000000000000=	1470
30600	0000000000000000=	40	31120	0000000000000000=	040
30600	0000000000000000=	30	31120	0000000000000000=	1900
30616	0000000000000000=	212	31130	0000000000000000=	400
30624	0000000000000000=	44	31144	0000000000000000=	1240
30632	1212121200000000=	72	31152	0000000000000000=	1240
30640	0000001C2222221C=	150	31160	0000000000000000=	1920
30640	0000000000000000=	26	31160	0000000000000000=	1960
30656	24242+200000000000=	200	31170	0000000000000000=	2040
30664	0000001C2424241C=	164	31184	0000000000000000=	310
30672	0404000000000000=	30	31192	0000000000000000=	1900
30680	0220200000000000=	146	31200	0000000000000000=	1920
30680	0000001C001C020C=	190	31210	0000000000000000=	2040
30696	0000000000000000=	32	31224	0000000000000000=	700
30704	1010100000000000=	62	31232	0000000000000000=	0
30712	000000242+242410=	170	31240	0000000000000000=	40
			31240	0000000000000000=	40

228 *Demetrius Unger, James J. Hodge*

Roy Coates
presents

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What about the parts the story tellers couldn't reach? After all, in Disneyland, everything was bound to be larger than life. Jack would have come across human-sized birds and insects as well as giant catapillars which changed, as well, to feed from the humanly waste in their search for human prey.

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Danger Zone

The in's and out's of the Clear command on the Dragon explained by Pam D'Arcy

YOU MAY have tried to run some machine code and had quite unpredictable results (or, worse, failure) because of having omitted to carry out a required CLEAR statement prior to CLOAD/EXEC. As some disk users have found out to their cost, failure to follow such operating instructions when a disk is in the drive can cause the catastrophic destruction of both the main AND backup directory sections of the disk. "But the machine was clear . . . I had only just switched on . . ." Such a major disaster from such a small slip . . . are some of the comments.

I am afraid so, but here I offer this brief insight into what goes on in the Dragon's memory, in the hope that it will fit itself in the forefront of your memory and ring the danger bells before disaster envelops your system. Take a look at Fig 1 and the associated Table 1.

Even when you haven't given the Dragon any work to do, it is not idle. It is, amongst other things, continuously checking for keyboard input and updating the TIMER value approximately 50 times a second. When carrying out such actions, it is using an area of memory for temporary workspace. This area of memory is known as the Hardware Stack.

Even when our programs are running,

unless told to, the Dragon continues to carry out the keyboard check and updating of the TIMER value, using the Hardware Stack for temporary storage, as before.

At switch on, the Hardware Stack starts at the highest address of Area D and works backwards towards the start or lowest address of Area D. It is not a fixed size, but expands and contracts (always from the highest address down) as is needed. Though normally uses only a few bytes at a time when carrying out the hardware functions, such as checking for keyboard presence and TIMER updates.

This doesn't generally bother us unless we want to run some Machine Code in an area of memory that clashes with the Hardware Stack at any time or that a Basic program may be using that area for its variables storage. It is the corruption of these areas by our machine code that causes the chaos because it causes the Dragon to lose its way in its very necessary, strictly ordered, existence. The high address end of the Dragon, just moments after switch on, is particularly vulnerable.

The CLEAR statement is used to guarantee a 'safe' house for machine code, using the syntax: CLEAR parameter 1, optional parameter 2.

Parameter 2 is the start address of Area F — an area reserved for machine code use! (The manual is a byte out). Whenever this start address is changed, the start/end addresses of Areas E and D are automatically adjusted, that is, the highest address of Area E becomes this address-1, the highest address of Area D (and hence the Hardware Stack) becomes the highest address of Area E-length of Area E.

Parameter 1 is the required length of Area E. The highest address used is unchanged; its lowest address is the highest address — (parameter 1) + 1. The length of Area E is set to 200 at switch on, also is set as parameter 1 of the last CLEAR statement issued (whether from the keyboard direct or from within a program). This then automatically adjusts the highest available address of Area D, and hence the starting position of the Hardware Stack.

For example, if immediately after switch on, you wish to run a machine code routine that is 400 bytes long at its default load address of, say, 32200, if you do not make the 'safe' house for it, it will load into the area occupied by the Hardware Stack (see Fig 1) with unpredictable results.

By typing: CLEAR200,32200 <ENTER> the resulting top end of memory map would be as shown in Fig 2.

The HARDWARE STACK now starts at address 31999, working downwards. One or more machine code routines may now be loaded into Area F, 32200-32767, and be EXEC'd with no fear of corrupting any of the Dragon's vital workings (unless the machine code itself is naughty!) and no fear of anything corrupting it unless a Basic or other machine code routine POKE's into this area directly.

To those who have suffered because of the Dragon's way of doing things, I can only commiserate and say — believe me, it is not a stupid way of organising things but a very powerful, dynamic system that outstrips other popular minis by miles.

- Area A — 1536 bytes reserved for Basic Interpreter workspace.
- Area B — 1536 bytes automatically and only reserved for Dragonides if the cartridge is attached at switch on.
- Area C — Default four graphics pages of 1536 bytes each.
- Area D — Where our Basic programs are loaded into memory and the space that non-string and array variables occupy.
- Area E — Default 200 bytes reserved for Basic simple string variable storage.
- Area F — Default one byte reserved for machine code.

Table 1

Fig. 2
MEMORY MAP AFTER CLEAR 200,32200 AFTER SWITCH ON

31999	32000-32199	32200-32767
AREA D	E	F

Figure 1.
MEMORY MAP AT SWITCH ON

Cartridge based system:

B=1535	1534-7679	7680-32200	32201-32766	32767
A	C	D	E	F

Dragon200 based system:

B=1535	1534-32767	32768-9215	9216-32200	32201-32766	32767
A	B	C	D	E	F

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HELLO AGAIN, and welcome to a very special column. Yes, this is a celebratory column. This column is two months old today! And all over the country the celebrations have started, dancing in the street, dancing in the dark, champagne in the night, exchanging glasses, wandering in the night, what were the chances, that The Expert might write a complete column without mentioning arcade games?

Yes, indeed, this is the second edition and I'd like right now to thank all those of you who wrote saying how excitedly you're you found the first one. In fact this column was awarded the coveted title of "Best Arcade Column in A Publication Called Dragon User". I stand a proud man.

So, to work. Thank you for the Pokes you have sent and please keep them coming, this month's contribution comes from one Mr M R Vine at Dagenham (nothing like familiarity is there), who, after an affectionate dig at Paul D Burgin has presented pokes for your delatation. He says that the colour location should be poked with 224, 232, 240, and 248 for Green 4-colour, Buff 4-colour, Black/Green, and Black/White screen colours respectively.

Some of these pokes require the auton to be disabled using the aforementioned Paul Burgin's methods (see Letters Dragon User, February '86). Here they are:

DUNKEY MONKEY: LIVES 15120, COLOUR 15862
ASTRO-BLAST: COLOUR 21087

SCREAMING ARCADE: COLOUR 10599 (BUFF IS BEST)
JET BOOT COUP: COLOUR 7529

MUDPIES: COLOUR 22660
MARIO MINER: COLOUR 12625, LIVES 12646 (UP TO 25 ONLY)

CAVERNS OF CHAOS: COLOUR 26885, LIVES 26885
(POKE TO ZERO FOR 108 LIVES)

COSMIC CRUISER (Do you mean crusader?): LIVES 8556
(POKE TO ZERO FOR UNLIMITED)

CUTHBERT IN THE COOLER: LIVES 8295 (BANK 14)
CHAMBERS: LIVES 12529
(This does not work on the Phrydacyl edition)

MOONHOPPER: - COLOUR 12827

QUAZMOGO: LIVES 15644
ROMANUS: REVENGE:

LIVES 15516
TUBERNARY ARMY: LIVES

12267, STAGE 12388 (1-6)
JET SET WILLY: COLOUR

7550
CANE FIGHTER: LIVES

20378 (POKE TO ZERO FOR UNLIMITED)
GALACTIC RAIDERS: LIVES

18664
HORACE GOES SK-ING: COLOUR 26556

ROBIN HODG: LIVES 15712, COLOUR 16884

SEA DRAGON: COLOUR 25569
SHOOTROOPER: LIVES

12665
And so Mr Vine claims the title of "King of the Hackers", unless, as Father would say, you know better.

The next item was good fun, and, what's more, it worked! It comes from Simon Mythen who lives in Chelmsley (see you down the lock some time Simon!) and runs this...

"After recently purchasing A-Ball from Microdeal" (where have you been for the past million years Simon?), "I was determined to find some sort of formula for potting all seven balls and the eight-ball. Well, I have succeeded! The procedure is as follows:

Break — Put the joystick in the top left position. The flashing line will appear after pressing the fire button. Leave the joystick where it is and press the fire button again. Finally, give the ball of the top, top right spin. Then, hit the ball with maximum force.

2nd Shot — Put the joystick in the bottom left position. Use bottom left spin and hit the ball with the third power.

3rd Shot — Again, bottom left on joystick and top right spin. Use full power.

4th Shot — As the second shot but use full power.

5th Shot — Top left on joystick and top right spin. Third power.

6th Shot — Joystick top right and for spin put the joystick slightly to the right of middle bottom. Maximum force.

7th Shot — Leave the joystick where it is. Top left spin and second power.

8-Ball — Make sure that the flashing line passes straight through the middle of the 8-Ball, use middle spin and the second power."

I've tried this and believe me it works (even a Cabinet Minister can do it and they have very, very, very small brains) and it's great. If you have any "solutions" to other arcade games then please send them in. I think you'll agree that they're more fun than Pokes!

Just to make things interesting this month, before you will see a number of screen shots of some old Dragon games — just like a stroll down memory lane, isn't it?

Well — if you think you can identify them, then write it to me — and the first one out of the hat (the ceremony to take place on June 10) will win a year's worth of subscription to this august journal. Best of luck!

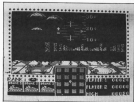
So, that's about it for this month, except to say to D.

Forster of Glasgow that if he ever sends the another letter in that lambs green pen I shall personally come around and show him a new use for "Jet Set Willy" (possibly redefining it in the process) Because he has won the award for "Worst Letter Ever Written Ever Since Year Dot When The World Began Ever" I do not intend to tell him the pokes he wants for "Jet Set Willy" for several months, even though we'll be publishing a map next time!

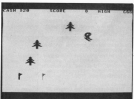
So, that's it for this award winning second birthday column. I wonder if this one can win the award for "Most mentions of Cabinet Ministers ever in an arcade column in a magazine called Dragon User", let's hope so, eh?

Remember, Cabinet Ministers are human too.

Remember, Arcade column writers often do.



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LAST MONTH I said I'd hope this time to look at both *The Words of Kesh* and *Space Trek II* as being a marvel of my word I'd do just that. Let me deal with *Space Trek II* first, and if you read the last column you'll know I was very enthusiastic about *Space Trek II* written by a reader and being sold by him in his guise as Boomcraft. This was quite a comprehensive adventure — I don't know it was set in a school, but on board the starship *Endavour*. Though the plot was derivative of many a Star Trek tale, the program was well done and the game had many unusual and enjoyable touches.

Sequel

So what of *Space Trek II*? Hard to say it relies rather too heavily on the first program, although the story has moved on somewhat. You have managed to arrive at the planet *Possibly*, and the first starship *Endavour* is circling above it — you're in the fifth ship in the *Endavour* series, and have to find out what happened to the first four. Here's one of them at any rate, and a scene of the ship has given you the useful information that the crew have all lost their minds. Probably been watching too many Star Trek repeats. But no, their ship is trapped in a strange force coming from the planet, and you must engineer a landing party to find the inside, beam them up and deprogram the force.

The program works in the same way as the first, in that you can switch between any of four characters: James, Sabon, Spaces and McCircle. Just as impressive as before, except that the author has decided that the adventure will still begin by entering on the vast number of locations on the *Endavour V*. I explained last month that the starship really is vast, and mapping it out gives you the feeling of actually exploring the ship as you move up and down between the six different levels of locations. As you begin *Space Trek II*, you soon realise that the starship has been reproduced exactly as before, and you encounter the same objects and people in the same places as first time round. I found this to be very disappointing and an awful waste of precious memory.

I admit to being limited on this as I hadn't worked out from the first game how to get off the ship and on to the surface of the planet beneath, and perhaps when you do this the adventure opens up more and becomes very different, but even if that is

the case I can't see that there's going to be the memory available to make *Space Trek II* sufficiently different from its elder brother. A quick inspection of the unprojected program shows the locations that are on the planet's surface, but they're far fewer than the ones in the starship that are duplicated from Part I. With the ability to switch between characters and move them independently, the game should have perhaps begun with them already down on the planet, which would mean you could have had any type of setting that you cared to create — jungle, desert, deserted city — and made it much more comprehensive, and as convincing as the first part was.

Nevertheless, if you're at all interested in adventures and particularly in writing them, you should invest £4 and get at least one of these two titles from Boomcraft at 30 Brooklands, Welwyn Garden City, Herts AL7 1PP. It's certainly like to see some more from the same author, but with settings sufficiently different.

Very different is its approach is *The Words of Kesh*, also written by a regular reader, Bob Aldridge from Wyfield, and now available for £5.95 from Quickbeam Software, 87 Old Maresfield Road, Brockbourne, Herts EN15 6PP. Though it's been out a short while now, Quickbeam's boss was telling me that very few copies have been sold, which I can't understand as it's a very good adventure. What's wrong with you adventurers out there? Every month I get lots of letters complaining that there are so few new Dragon adventures, and yet when people bring them out no one seems to bother buying them!

Brigands

End of sermon and on to the game itself which is also going to be a multi-part adventure, if enough people buy this first part, subtitled *Skull and Bones*, in this, your role is as the only child (male or female, and that's later relevant) of a poor tradesman in the seaport of Ras Sharma. On his deathbed your father gave you a gold ring, and begged you to return it to the inner sanctum of the Temple of Kesh. This you set out to do, but when just in sight of the Temple a gang of brigands rob you of all your possessions and dump you in an oasis.

With this watery start you begin the adventure, and it's important to read this and other location descriptions carefully, as

clues are sometimes contained in them as to what you should do or where you might try to go. The player that needs your two-wind inputs is a little funny, and frequently you're searching round for the right couple of words even though you think you know what it is you should be trying to do. In this aspect of the game's vocabulary is a bit restricting, the location descriptions certainly aren't, which is something that enhances the game. A lot of care has been taken to make the text more descriptive, such as in the lonely waste land where you find not merely a dead tree but: "A dead tree stands close by like a skeletal monument to some dead hero." Or outside Selma's Cave where "thin wisps of smoke drift out of the entrance and out gently spreads", though little do you know from that soothing description what awaits you inside the cave!

Input

The program response tends to be rather slow, and it's a little irritating that once the response to your input has been printed, you then have to press another key to have the screen updated, after a suitable pause. Also, what initially seems like a virtue later proves to be something of a drawback. This is the feature that gives you a full location description on your first visit, but only a brief one should you return to that place. For the most part this doesn't matter, but in one place I found a red dragon barring my way, then when I later returned with what I hoped might ease the beast off, it was no longer there. At least it seemed not to be, so I was at a loss for a while as to what to do. Then I typed LOOK to summon up the full location text and there was my adversary... which I promptly dispatched.

These little drawbacks don't prevent your enjoyment of the game, however, and this is definitely one that's more suited to the patient and experienced adventurers. Fewer locations, it seems, than the two *Space Trek* adventures, but more description and tougher problems all round. Try it.

Now I recently reviewed Cowan Software version of *Colossal Cave*, and mentioned that I didn't have a SAVE feature, which the original mainframe version of this classic adventure didn't have either. That has now been rectified, however, and the program STOP will send you into the SAVE routine, so don't let that last put you off sampling this abbreviated version of a piece of

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Finally on to some of the species you've seen in the month. Carl Trust of 111 Hayden Road, Rushden, Northants NN16 8HX has completed a few adventures now, but is struggling to map *Juncostipitation*. He asks if anyone has made a successful map of the lands, which they might be prepared to photocopy and let him have "at a small cost." Over to you, map-makers.

Some clues on that same game come from Michael Emrley, 3 Laidlaw Road, Kinnaird, Kirkcaldyshire AB9 0JG. He reminds other readers that you need to use the camera twice, and that you should be able to cross the Yellow Barron's lands by starting at the fortress of Darnnesses Brown and Green and moving carefully from building to building. In return, Michael would like someone to tell him if you can control the bus in Chickwood, and also help with three questions on *El Quabere*: how to get the eagle's feather, where to dig the stick, and what use are the two *crucifers*.

Sgt John Moore of R&P Wastewater plays adventures when he's not knocking base cheap beer in the Bargains'n' more, and he's currently lost, wandering round the endless Rag Zone in Jorhaggaeton. My first advice could be NEED EHT FFD YAL, John, but more helpful is a simple MIGHT BETWE OT DEEN OW SI GHOOT

More successful in this game, which does seem to be dominating the southeast-

lately, is Ole Eloy, one of several Norwegian readers I hear from regularly. Ole's scored 80% so far, with all 82 tags except the black one, so maybe by the time this appears you'll have successfully completed that and have your order in for the follow-up. Ole, this is also written for himself: a little machine code routine which has enabled him to list all the available commands in Teletype and Z8 Diagnostics. There are too many to list here, but if anyone thinks they might be useful send the size and I'll make a few more available.

More room to list a few magic words from Mark Ingram on *The Hot Telling*: HTLCH, ADM and MOLE HEE. I'll leave you to figure out where they work. Thanks also to Ray Thomas of *Haverfordland* and

Veagher or Cardiff for clues on *John Q. Jones* and a first place of help to Stephen Samuels of Cartesian who was having trouble bringing on the Forest Moon in *Planet of the Apes*. (For that you need a **ROMAN REINTEGRATION**, Stephen, and you pay that from the **FACTS LAPORER**, but only if you've reached Capital Level 2. That's a **thing** that applies to both Winslow's "thing" categories — if a problem seems insoluble, it may be because you haven't built up enough experience to enable the solution to the problem to become available to you.)

Experience tells me I'll be back again next month, and do let me know if there's anything you feel isn't sufficiently covered in the corner, won't you?

Adventure Contact

To help puzzled adventurers further, we are instituting an Adventure Helpline — simply fill in the coupon below, stating the name of the adventure, your problem and your name and address, and send it to Dragon User Adventure Helpline.

line, 12/13 Little Newport Street, London WC2H 7PP. As soon as enough entries have arrived, we will start printing them in the magazine.

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Adventure Return of the Five Problem Wizard help on getting magic grain, Book of Skulls and amulet. Name: Gary Bird. Address: 10 Millard Terrace, Station Road, South Weymouth, Mass. 01981.

Adventure Shenanigans
Problem How do I get out of the city? Do you go down Five Escape — and if so, how?
Name Joe Shepherd **Address** 65 Elm and Street, Minneapolis

Adventure Returns of the Ring
Problem Where can I find the
story? Name Previous
Address 42 Ocean Road, Alton
Clife, Scotland, FK10 2JP

Adventure Training Problem
How do I cross the deep chasm in the garden? Name: D. Permyan. Address: No address.

Adventure Ring of Darkness
Problem I can't get enough hit points to get to the other side of the map. How often have you...

be nice, too. Name: Richard
Brady Address: 3 Cornaby
Close, Acton, Middlesbrough,
Cleveland TS20 2JN

Adventure Workbook Problems
I have opened the gates in the
Times underground System!

But cannot get past the second register. Help! Name: John Patton Address: 65 Springfield Avenue, Brough, North Hants. Phone: 01753 5382

Adventure **Jonathan** **Adventure 2** **Problem** How do you get through the golden gate? What happens at the Dead Sea? **Name** **Malcolm Burns** **Address** **Broomers, Kilconquhar** **File, Lovers, File, Scotland**

Adventure **Justification**
Problem: I can't get the answer — what use is the girl at the last stop? **Name:** Paul Knight
Address: 27 Fobbing Road, Corringham, Stanford-le-Hope, Essex, SS17 9BB

Adventure Ring of Darkness
Problem Any help please —
 also, where can I find the Jelly
 Cube? **Name** Sarah Mitchell
Address 23 Cherry Tree Ave-
 nue, Church Lorton, Stoke-
 on-Trent

Adventure Mission One Problem How to get rid of the droid at the lift entrance? Name Christian (no Address) 4 Rajan Highway, Coventry, CV3 9BA

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Problems How do you get the best? Where is Baron Red's best? Name Simon Jones
Address 37 Collins Meadow
Harlow, Essex CM19 4EN
Adventure Tricorder Problems
Once at planet, how to get to the surface? How to fight the
Dark Race? Name Richard
Boardman **Address** 13
Chickadee Close, West Ashton,
Tinsbridge, Wilt.

Adventure Trekker Problem:
How do you get across the chasm on the Planet Atom?
Can offer help on Franklin's Tomb, Lost in Space, Fishy Business, Mangan Adventure, Jerusalem Adventure 2 and Williamsburg Adventure 3.
Name C. A. Jones Address 17 Hart-Y-Plymouth, Blacksburg, West Virginia

Advertiser: Sheranigans
Problem: How to get the 12th pole into the cave and how to read the billboard?
Name: Paul Sharpe
Address: 185 Western Crescent, Beaumont, Lethbridge, L3C 1K4

Adventure: The Kat Trilogy — Temple of What Problem How to get into the small hole? **Movie: Brian Blessed: A Journey**

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Adventure **Autobiography**
Wings of War/Patterson's
Diary(B) Diablo Problems
Where are the Deeds of
Brown? How do I teach the
Bomb? How do I get into the
Island House? Where is the
Oil? Name Sgt Sloan Show
Address c/o Sgt Sloan DC
HQ Sign (MT, 22) Sgt Negl.
DEBDB 197

Adventure Begins of Caviar Problems I can't find the blue key card, and I can't avoid the blue key card, and I can't avoid the assassination of the Name Mr D Pomer Address 6 Woodside Street, Canada, 95 Boston

Adventure I cannot get past the porch, and can only find the torch and the rope in the front-room. Name: Mrs. M. Green. Address: 10 Flower Close, Thetford, Norfolk, (IP24 8DU)

Adventure Sea Quests Problem: Where do I get the key to gain entry to the beach house? How do I use the detector? Name: Matthew Saunders Address: 18 Water View, P.O. Box 4004, 4004

JUNE PUZZLE

Gordon Lee takes a random walk around number generation — and sets this month's puzzle

READERS with programming experience will be familiar with the "random" feature available in Basic, although this is a command which must be used with care, as we shall see later. Outside computing, tables of random numbers are used for statistical sampling techniques. Even so, this use is a relatively modern phenomenon. I can do no better than quote from an article by Alfred M. Bork on the subject: "... before the twentieth century no one would even have thought of the possibility of producing books like this; no one would have seen any use for it. A national nineteenth-century crisis would have thought it the height of folly."

Methods used for producing lists of random numbers have been varied and varied. In 1657, a table of 41,400 random digits was produced by taking the middle digits of the areas of parishes in England; while in 1848, a table of 105,000 digits was extracted from United States freight receipts. Other methods have involved dice, roulette wheels, and measurement of the rate of decay of certain radioactive isotopes.

With the arrival of computers (and calculating machines before them) it was soon realised that a random number facility which could be used in conjunction with these machines would be an advantage. Clearly, programming in an actual table of random numbers would be both impracticable and wasteful of memory; so methods were devised which would enable the machine to generate its own series of random numbers.

An early method proposed by John von Neumann was known as the "middle of the square" method. Here the computer is first "seeded" with a random sequence of digits

chosen by the operator. The computer then squares this number, extracts the middle digits of this square and repeats the procedure as often as required. For example, if we were to start with the number 5478, and extracting the middle four digits each time, we would get the series 5678, 2281, 7168, 8748, 1584, ... and so on. Note that in generating this series, any square with less than eight digits is supplemented with extra zeros added to the left-hand side of the number to bring the total number of digits to eight, before the middle four digits are extracted. This method rapidly fell into disfavour as the sequences produced were too short, usually terminating in an endless loop of repeating values. Consequently, other, more sophisticated techniques were devised.

As was mentioned earlier, the random number generator on the Dragon is straightforward in use, but requires a little care to ensure a truly random selection. For example, after switching on the Dragon type in and run the following line: `FORN=1 TO 19 PRINT (RND*(9))NEXT`.

As you might expect, the computer will dutifully print out a list of ten numbers at random, each number being in the range of 1 to 9. There is nothing surprising about this, but what is surprising is that the numbers so produced are always the same sequence. In the case quoted, a sequence 5, 3, 2, 6, 5, 5, 3, 1, 6, was produced. In practice, this means that some device needs to be written into any program to prevent this degree of predictability occurring. A program which, for example, deals a hand of cards is of little use if it always selects the same cards everytime that the game is run from "cold".

Next month we will be looking at ways

around this problem, but in the meantime readers might be interested in the following curiously based on a random number selection routine. First of all switch on the Dragon from cold and then type in (or load from tape) the following program:

```
10 CLS: G=10: Y=7
20 PRINT "1732-5,***"
30 R=RND*(9)
40 IF R=1 THEN G=G-1
50 IF R=2 THEN Y=Y-1
60 IF R=3 THEN G=G+1
70 IF R=4 THEN Y=Y+1
80 IF Y=0 THEN G=G
90 GOTO 20
```

When run, the program prints a star in the centre of the screen and then selects a series of random numbers in the range one to four inclusive. A route is then traced moving up, left, down, or right, depending on whether the random number was one, two, three or four respectively. At each new location another star is printed to mark the path taken. Line 80 stops execution of the program when the path extends beyond the top edge of the screen. The curious feature is that (at least on the author's Dragon!) the pattern so produced resembles the Dragon-Logo! Remember though, that each time the program is run the computer must first be switched off, then on again, and the program reloaded.

For this month's competition we are returning to John von Neumann's "middle of the square" method of producing series of random digits. As was mentioned, certain numbers produce short sequences, some even are self-repeating. One such example is 3792 whose square is 1439264. However, can you find a four-digit number, all of its digits being different, which repeats itself after four operations? Good luck!

Prize

For the June competition, we've got something to excite Dragon arcade fans — the lucky winners will be receiving a copy of Gordon Barnes, from Simlinton Computing, which they describe as, "a multi-screen magazine for the Dragon 32K4. Hold on a bit — they also say it's "thoroughly dull, silly and repulsive." ... and with non-eating toilets on the loose. I'm not arguing with that in any case, surely a prize fit for ... a competition winner?"

Rules

As usual, to win the game, you must show the answer to this month's competition and show how you solved it, with the use of a program written on your Dragon. For the sake of our strange administrative purposes, please do not send in cassettes containing a copy of the program, and don't forget to mark your entry — JUNE COMPLETION. And we know it sounds obvious, but don't forget to clearly mark your

name and address on your entry — someone always forgets ... and next month we're threatening to publish the offenders in a Mail of Shame, so watch it.

This month's take-away — yup — you're going to have to come up with another of those phrases. Try completing the following in less than 10 words — "that means you can be dangerous because ..." Anything else will be circulated around the office, and then disapproved!

March Winners

The March goods giveaway was 25 copies of Quikbeam's 8809 express — and congratulations go to the following, who will soon be receiving their prize: M Owens of Tontag, Rachel Edwards of Sedgefield, Dave Lardner of Rotherham, Ray Woods of Basingstoke, J Taylor of Aylesham, Neil Richardson of Swinton, C Dean of Enfield, C Richardson of Heston, Douglas Moxley of Ruislip, G Hall of Camforth, J Singer of Tyers Green, A Breakwell of Wyke, Richard Moss of Blackpool, C Newman of

Addleton, Mark Heaps of Washington, G Barber of Sutton Coldfield, D Marsden of Ganton, G Gray of Middlesbrough, Hywel Roberts of Newport, P Woodson of Atherley, M Stenton of Stoke Newham, Simon Aulworthy of Swinton, Kieron Brooks of Aylesham, J Dillmore of Carlisle, and finally Matthew Gifford of Northampton.

The take-away produced many fascinating programs, but Matthew provided the best, with "The train approaching Platform Five as the [correcting feedback] to [incomprehensible destination] stopping at [random double Dutch]." We Philippe Boudry of France please write in and explain his entry — which went ... "it was [obtained] ... there was hundreds of cows." It obviously does something in translation — and we're being used trying to plumb its enigmatic depths.

Solution

For those still struggling for those who got it wrong! the answer was 0.744 feet or 9.93 inches.

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1. *Journal of the American Medical Association*, 2000; 283: 2689-2693.

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 CITY OF CHICAGO
 COUNTY OF COOK
 STATE OF ILLINOIS
 POSTAL CODE

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